

## CLAIMS

1. A method for launching a spacecraft into an earth orbit, including the  
5 steps of:
  - providing a spacecraft having a lifting body and at least one rocket engine;
  - supporting the spacecraft on a ground-based vehicle;
  - accelerating the ground-based vehicle and spacecraft horizontally to  
10 achieve aerodynamic takeoff speed of the spacecraft;
  - separating the spacecraft from the ground-based vehicle;
  - said at least one rocket engine powering the spacecraft from horizontal  
liftoff to earth orbit;
  - said spacecraft thereafter reentering the atmosphere and gliding back to  
15 the earth.
2. The method for launching a spacecraft of claim 1, further including the  
step of providing a turbojet engine to power the ground-based vehicle.
- 20 3. The method for launching a spacecraft of claim 1, further including the  
step of refurbishing and reusing the spacecraft after gliding back to earth.

4. The method for launching a spacecraft of claim 3, further including the step of providing the spacecraft with a removable unitary belly assembly extending to cover the bottom surfaces of the entire spacecraft, and replacing the belly assembly during refurbishing of the spacecraft.

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5. A system for launching a spacecraft into earth orbit, including:  
a spacecraft having a lifting body and at least one rocket engine;  
a ground-based vehicle for supporting said spacecraft during launch, said ground-based vehicle including means for accelerating said spacecraft

10 horizontally to achieve aerodynamic takeoff speed;

means for separating the spacecraft from said ground-based vehicle when said spacecraft attains aerodynamic takeoff speed;

said at least one rocket engine powering said spacecraft from horizontal liftoff to earth orbit;

15 said spacecraft being capable of reentering and gliding in the atmosphere to return to earth.

6. The system for launching a spacecraft of claim 5, wherein said means for accelerating said spacecraft horizontally includes at least one turbojet engine  
20 in said ground-based vehicle.

7. The system for launching a spacecraft of claim 5, wherein said spacecraft includes a non-monocoque internal structural framework.

8. The system for launching a spacecraft of claim 7, wherein said internal structural framework includes a pair of main spar assemblies extending longitudinally in said spacecraft, said main spar assemblies being spaced apart  
5 equally about the centerline of said spacecraft.

9. The system for launching a spacecraft of claim 8, further including a thrust plate joined to like aft ends of said main spar assemblies, said at least one rocket engine being secured to said thrust plate.

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10. The system for launching a spacecraft of claim 9, further including a pair of rocket engines secured to said thrust plate and oriented to deliver thrust forwardly along said centerline of said spacecraft.

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11. The system for launching a spacecraft of claim 9, further including a crew cockpit module secured between like forward ends of said main spar assemblies.

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12. The system for launching a spacecraft of claim 11, further including a cargo bay disposed forward of said thrust plate, aft of said crew cockpit module, and between said main spar assemblies.

13. The system for launching a spacecraft of claim 8, further including

a plurality of crossbeams extending laterally and spaced apart longitudinally in said spacecraft, said crossbeams being secured to said main spar assemblies.

14. The system for launching a spacecraft of claim 13, wherein said  
5 crossbeams include outboard portions extending laterally outwardly of said main spar assemblies.

15. The system for launching a spacecraft of claim 14, further including a plurality of wing spars extending laterally outwardly from said outboard portions  
10 of said crossbeams to extend into and support laterally opposed wings of said spacecraft.

16. The system for launching a spacecraft of claim 14, further including a first plurality of fuel tanks disposed in said spacecraft, said first plurality of fuel  
15 tanks being secured to said outboard portions of said crossbeams.

17. The system for launching a spacecraft of claim 16, wherein said first plurality of fuel tanks are adapted to hold liquid oxygen fuel.

20 18. The system for launching a spacecraft of claim 16, wherein said first plurality of fuel tanks are disposed in equal spacing about the centerline of said spacecraft.

19. The system for launching a spacecraft of claim 16, further including a second plurality of fuel tank assemblies disposed in said spacecraft.

20. The system for launching a spacecraft of claim 19, wherein each of  
5 said second plurality of fuel tank assemblies includes an upper surface that comprises an upper outer surface portion of said spacecraft.

21. The system for launching a spacecraft of claim 20, wherein each of  
said second plurality of fuel tank assemblies is generally lenticular in outer  
10 configuration, including an upper convex surface that comprises a portion of the outer surface of said spacecraft.

22. The system for launching a spacecraft of claim 19, including a pair of  
said second plurality of fuel tank assemblies spaced laterally and equally from the  
15 centerline of said spacecraft.

23. The system for launching a spacecraft of claim 22, wherein each of  
said second plurality of fuel tank assemblies is disposed superjacent to at least  
one of said first plurality of fuel tanks.

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24. The system for launching a spacecraft of claim 19, wherein said  
second plurality of fuel tank assemblies are adapted to contain liquid hydrogen  
fuel.

25. The system for launching a spacecraft of claim 24, wherein each of said second plurality of fuel tanks includes an expandable bladder, said expandable bladder being changeable from a first disposition in which the bladder is collapsed and compact when said fuel tank contains liquid hydrogen, to a second disposition in which the bladder is expanded to fill said fuel tank when it is emptied of liquid hydrogen.

26. The system for launching a spacecraft of claim 5, wherein said spacecraft includes a main body section and laterally opposed wings, and a continuous bottom surface extending along said main body section and said wings.

27. The system for launching a spacecraft of claim 26, further including a unitary belly assembly of said spacecraft, said belly assembly forming said continuous bottom surface of said main body section and said wings.

28. The system for launching a spacecraft of claim 27, wherein said belly assembly is removable as a unit from said spacecraft and replaceable.

29. The system for launching a spacecraft of claim 28, wherein said belly assembly includes a plurality of reinforcing members and a plurality of insulation layers laminated to said reinforcing members.

30. The system for launching a spacecraft of claim 29, further including a leading edge assembly secured to the leading edge portion of said belly assembly.

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31. The system for launching a spacecraft of claim 30, wherein said leading edge assembly comprises a carbon fiber composite assembly extending continuously along the entire leading edge of said belly assembly.

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32. The system for launching a spacecraft of claim 26, further including a pair of vertical stabilizers, each extending vertically from an outboard portion of each of said wings.

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33. The system for launching a spacecraft of claim 32, further including a pair of elevons, each extending from one of said vertical stabilizers to said main body section.